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Short Note

Smoking of shrimp and fish from coastal village of north-west Bangladesh

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Abstract

Traditional smoking of mixed shrimp species is a method of preservation in coastal region of Bangladesh. Besides traditional smoked shrimp, attempt had been made to produce smoked shrimp from brown shrimp, *Metapenaeus monoceros* and fish from mugil, *Liza parsia* and the quality of smoked product was found good very on the basis of physical properties, proximate composition and mineral contents of the products.

Key words: Smoking, *Metapenaeus monoceros, Liza parsia*

Fish preservation is a crucial aspect in coastal community of Bangladesh. Smoking of shrimp in rainy season is a good technique for preservation since time immemorial due to no other alternative methods available in rainy season. Smoking has been practiced in many south-east Asian countries, e.g. fish and prawn in India (Salagrama 1990), tuna in Maldives and Sri Lanka (BOBP 1988). This product is economically high-priced and is used as food by large numbers of coastal people.

Smoking kilns normally runs during rainy season when plenty of mixed species of shrimp are available in coastal rivers. However, smoking of fish in coastal areas or freshwater species have not been yet tried. Smoked snakehead is a popular dish in some areas of India (Lilabati *et al.* 1997). Consideration information on the chemical composition of wood-smoked foods in general is available but very little is known on the smoked fish in Bangladesh (Hoq *et al.* 2003). However, the objective of the present study is to produce high quality smoked product from shrimp and fish species.

Traditional typical smoking kilns available in Paikgacha, Khulna were used to produce smoke shrimp (mixed spp., horina *Metapenaeus monoceros*) and fish species (mugil *Liza parsia*) with certain modification where temperature was controlled by providing hot air circulation. Fish and shrimp samples were initially preheated in smoking kiln for 30 min and then smoked for 6 h.. Fire wood and saw dust were used as smoke producer. After 6 h. of smoking, the products were allowed to cool at room temperature and finally stored in polythene bags.

Proximate composition of smoked products was determined according to the methodos described in Association of Official Analytical Chemists (AOAC 1980). Mineral composition was determined using an atomic absorption spectrophotometer following modified method of Cresser and Parson (1979).

The smoking kilns/huts are bamboo-made structure with sloping roof of mangrove origin thatched golpata (*Nypa fruticans* leaves). Sometimes a muddy wall having 1 meter height is made surrounding the kiln. Usually the size of the kiln is about 5-7x3x3 meters which can be opened along one side like a flap. A platform made of bamboo slates and woven reeds is made about 1.5 m from the floor. At least 18 fire-place are operated inside the kiln and the wood like sundri, tatul, babla etc. are used as fuels. The burning inside the kiln is controlled by a long arm bamboo-made handle, which is operated through the holes of kiln. The kiln has enough ventilation to exit the smoke produced.

After washing and removal of excess water from shrimp and fish body, they were weighed (100-120 kg) and placed on the bamboo platform on the burning wood in the fire-places. Required quantity of firewood used was to produce sufficient smoke. After 2 hours of smoking, when colour of the shrimps/fishes became reddish, the samples were turned into upside down with the help of a long arm wooden handle. The fire-places were operated for 6 hours and then the burning charcoal were extinguished with water, and smoked shrimp/fish were kept inside the kiln another 2 hours to become cooled. After that the folded door was opened and the end products was taken out and weighed for yield estimation.

The inside temperature of the kiln was recorded at every 30 minutes interval with the help of a Celsius thermometer. Temperature was measured on the surface layer of shrimps/fishes placed on bamboo platform at 3-5 different places inside the kiln. For better understanding on temperature distribution inside traditional kiln, 6 smoking kilns were monitored and temperature during smoking operation was recorded on consecutive days. The initial temperature was 32^0C and temperature rose to 40^0C during first one hour of smoking. After 2 hours when the shrimp/fish on bamboo platform turned upside down the temperature stood at 45^0C, then it further increased to 55-60^0C in 4 hours period. The temperature then gradually fell to 40^0C when smoking operation was closed down. As the kiln was made of bamboo splits structure, it had enough ventilation through which some heat is expected to lose. Previous observation revealed higher temperature of 92-94^0C in 4h period which fell to 75^0C in 6h period (Hoq *et al.* 2003). Relation of humidity with temperature inside the smoking kiln is presented in Fig. 1. The initial humodity was recorded as 75% which gradually fell to 58%.

After smoking operation, smoked shrimps and fish were used for immediate analysis. The smoked product normally stored in bamboo basket or bags made from reed stem and marketed during the lean season. Table 1 represents the physical properties and proximate composition of smoked product. Smoked horina represented highest protein content. On the other hand, smoked fish showed highest lipid content.

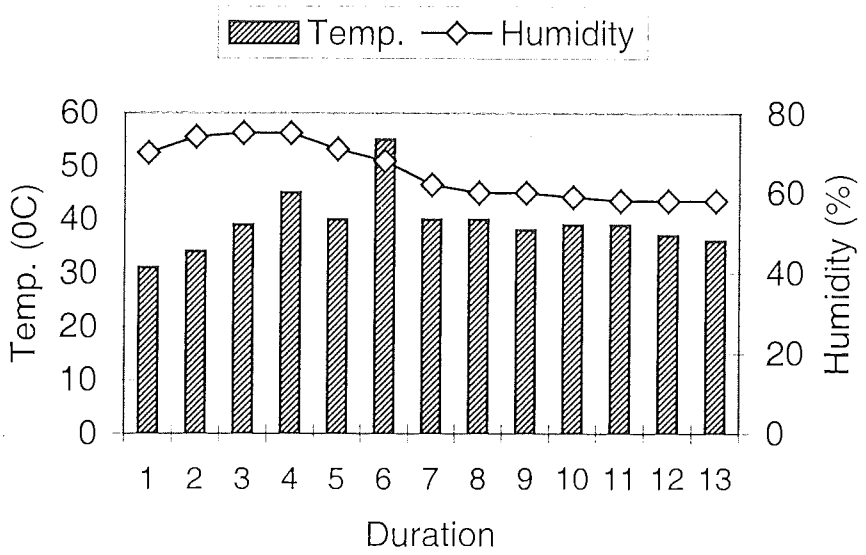

Fig. 1. Temperature and humidity in side smoking kiln.

Table 1. Proximate composition of smoked shrimp and fish

	Moisture (g/100g)	Protein (g/100g)	Lipid (g/100g)	Ash (g/100g)
Fresh shrimp	79.95	14.51	2.33	3.1
Fresh horina	80.73	14.91	2.18	1.81
Fresh mugil	78.31	16.12	4.02	1.55
Smoked shrimp	14.3	64.38	9.86	12.0
Smoked horina	15.1	66.67	9.95	11.8
Smoked fish	13.6	58.58	15.82	14.3

In an attempt to evaluate the nutritive value of smoked product, mineral composition of the product are given in Table 2. Smoked shrimp was found to be rich in phosphorus. Smoked fish was rich in calcium and iron.

Table 2. Mineral composition (mg/100g) of smoked shrimp and fish

Sample	Phosphorus	Magnesium	Calcium	Zinc	Iron
Smoked shrimp	1000	155	92	5.4	17.1
Smoked horina	890	160	90	4.6	16.8
Smoked fish	860	160	184	5.2	44.2

A good quality smoked product that keeps well must lose 12-14% of its original weight during traditional smoking. Traditional kilns often give the operator little or no control over the smoking process, although shrimps/fish are turned upside down on

bamboo-split platform after 2 hours when the inside temperature rise to 45^{0}C and final smoking was completed in 4 hours time at 55^{0}C. After 4 hours folded door was partially opened to reduce the inside temperature to 40^{0}C at the closing of smoking process (extinguishing of fuel woods). Brining was not done in smoking process as the raw shrimps are originated from moderately salt water sources (river salinity10-20 ppt), although brining is recommended in hot smoking for flavour development (Bannerman 1976). Shrimp smoking in India seems to be different, where previously sun dried shrimps are smoked for 2 hours with the shelf life of 4 weeks only (Salagrama 1990).

From nutritional point of view smoked shrimp can be considered as a product with good nutritive value. Smoked product from brown shrimp yielded better nutritive value than mixed species. Use of fish in smoking process need further investigation. Smoked shrimp is generally packed in special cylindrical basket made of reed stems and marketed in bamboo basket. Smoked products are vulnerable to damage and loss after processing (Poulter *et al.* 1988). Kaneko (1976) observed that quality of smoked fish products can be deteriorated due to mold growth if the moisture content is above 15%. Attempts should be made to reduce the rate of moisture absorption of the product by using appropriate packaging material or storage facilities.

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References

AOAC (Association of Official Analytical Chemists), 1980. Officials Methods of Analysis, 13th ed. Washington, DC. 1018p.

Bannerman, A.Mck., 1976. Hot Smoking of Fish. Torry Research Station, Aberdeen, pp 15p.

BOBP (Bay of Bengal Program), 1988. Fish smoking in the Maldives. *Bay of Bengal News,* December 7-8.

Cresser, M.S., J.W. Parson, 1979. Sulphuric-Perchloric acid digestion of plant material for the determination of N,P,K, Ca and Mg. *Anal. Chem. Acta.,* **109**: 431-436.

Hoq, M. Enamul, M.N. Islam and M. Kamal, 2003. Nutritional qualities of smoked shrimp from the sundarbans mangrove area, Bangladesh. *Pakistan J. Sci. Ind. Res.*, 46(5): 376-382.

Kaneko, S., 1976. Microbiology of smoked fish. *New Food Industry,* **18**: 17-20.

Lilabati, H., N. Bijayanti, W. Vishwanath, 1997 Biochemical and microbiological quality of smoked *Channa punctatus* available in Manipur. *Fish. Technol.,* 34(2): 21-25.

Poulter, R.G., G.R. Ames, N.J. Evans., 1988. Post harvest losses in traditionally processed fish products in least developed countries. In: Post Harvest Losses. International Centre for Marine Resources, University of Rhode Island, USA. 33-145.

Salagrama, V., 1990 Where is fish smoked in India? Come to BCV Palem, Andhra Pradesh. *Bay of Bengal News,* September, 6-9.

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